# NINTH ANNUAL GRADUATE FORTNIGHT

## "Trauma; Occupational Diseases and Hazards"

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### THE MEDICAL PROBLEM IN FIRST AID*

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The proper care of persons sustaining injuries in accidents is one of the greatest public health problems of the present day. We have been awakening to the magnitude of the annual accident toll only in the past few years. Thus far the general public is probably better informed and more interested and aroused than is the general medical profession. The "Principles of Medical Ethics" of the American Medical Association, Chapter IV, Section 1, states: "Physicians, as good citizens and because their training specially qualifies them to render this service, should give advice concerning the public health of the community." Greater knowledge of the first aid problem is necessary in order to conform to the principles and ideals of our profession.

According to the latest report of the National Safety Council 100,000 American lives were lost through accident in 1935. In addition, 9,340,000 people sustained non-fatal injuries. That is, one out of every fourteen persons in the United States was hurt in an accident last year. The odds seem rather large in favor of some of us being among this group in the coming year. The estimated cost of these accidents is $9,500,000 each day during last year, a total of $3,450,000,000.

The dangerous spots as far as death is concerned are in order, first, motor vehicle accidents; second, the home; and third, public accidents which include drownings, burns, falls, heat prostration, freezing, railroad, firearms and poisoning. Only following these do occupational accidents appear, making up less than half the number of traffic deaths. Among these there are more farm deaths than in any other classification of employment.

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The order is somewhat different for permanently disabling accidents,—being as follows, the home, the automobile, occupation, public accidents. The order is still different for those temporarily disabled,—the home, public accidents, occupation, the automobile. It is important to note that, in the comparative danger of these three types of results of accident, the home takes first place twice and second place once, while occupational hazard stands in last place once and third place twice.

The National Safety Council and similar organizations are exerting tremendous effort and spending large sums of money in educating the public in accident prevention. Results are evident in reducing the accident frequency rate, although the gross number continues to increase. It appears that for many years to come accidents will constitute a severe personal and economic loss.

Some of the deaths and some of the permanent disability may be prevented by prompt, efficient first aid. The morbidity may be diminished considerably by the same means. The initial care at the site of accident has always been, is, and always will be, rendered usually by lay persons. With nearly ten million accidents a year we cannot expect a physician to be present where they occur, or to arrive before something is done, in the majority of instances. Many times this initial care will be the deciding factor between life or death, between permanent or temporary disability, between prolonged hospital care and loss of time or no disability. Many times treatment given by a physician at office or hospital cannot undo the lack of care, or the improper rendering of it, at the site of accident. As physicians we should know the most approved methods of first aid, not only because we might occasionally be called on to render it ourselves, but largely because we should be able to direct the methods of lay training in proper channels.

It is notable that there has been considerable objection from members of the medical profession to laymen being trained to render first aid. Some apparently believe that knowledge of this subject by the layman will keep practice

away from the doctor. We must remember that in instruction, first aid is uniformly defined as the temporary assistance rendered a sufferer until the arrival of medical aid. There is no intention or desire that it be a substitute for medical treatment. Others apparently think that lay first aid may do more harm to the injured person. For bystanders to do something in case of accident is an evidence of natural sympathy. Even the lower animals crowd around an injured mate and express their sympathy or give their aid. How much better it is to have aid rendered by someone with even a little knowledge and training than by one in absolute ignorance of the first principles, since something will be done anyway. Cooperation of the medical profession in lay first aid instruction should exist, rather than bringing arguments against it.

There has been no organized effort to train the medical profession in first aid. The medical schools which give any instruction in this subject are a rare exception. The result is that the average medical student on receiving his degree knows less about it than a first class Boy Scout. If he takes an internship in a hospital with an ambulance service, if he becomes an industrial, mine, railroad or police surgeon he may become interested. But in most instances these activities are soon shunted to the side line and his interest wanes. The rank and file of the profession consider the subject outside their field or are not aware of its extent and importance. The prime movers in first aid instruction have therefore come from the lay public, aided by an occasional physician. Many different books of instruction have been published, sometimes advocating diametrically opposed methods of care. The content is often criticized by physicians, sometimes justly, but frequently without sufficient practical experience to appreciate why certain items have to be included. Improved forms of treatment are adopted by the medical profession, but may not be incorporated in first aid books for years, because the profession did not know how to place them before a layman practically. In other instances first aid workers have devised improved methods which have not

been adopted generally by the medical profession, because of lack of close contact with the work. Much is to be gained in the care of the injured by closer cooperation between these two groups to their mutual advantage.

A history of the development of first aid does not seem to have been written and the piecemeal evidence of its early existence is unsatisfactory. Many of the miracles of the Bible were probably examples of sensible first aid. In the seventeenth chapter of the First Book of Kings we find an early instance of resuscitation. Elijah lived about 900 B.C. and this was performed by him on the son of the widow of Zarephath. He "fell sick, and his sickness was so sore, that there was no breath left in him." Elijah laid the child upon his own bed. "He stretched himself upon the child three times, and cried unto the Lord." "He revived." This seems to be a forerunner of the modern methods of artificial respiration, possibly the Sylvester method.

War has been a major occupation of the peoples of the earth from earliest known history. Literature is filled with its gruesome details, but there is little reference to affording any means of relief for the wounded, probably because it was usually non-existent. It is likely that the first practitioners of the art of healing in common life were women. The first surgeons were doubtless warriors to whom aptitude or experience gave special skill in treating wounds. Livy tells that after a battle with the Etrurians in the fifth century B. C. the Roman general distributed the wounded among the patricians. Xenophon in his "Retreat of the Ten Thousand" says that after the battle of Cunaxa, about 400 B. C. he appointed eight doctors because there were many wounded. His manner of stating it indicates that they were selected from the other soldiers.

Alexander was accompanied in his march of conquest by the most famous physicians of his age, one of whom extracted an arrow from his shoulder, and another showed great nerve and skill in cutting the barbed head of a javelin from the conqueror's breast. When Ptolemy Philo-

meter received a fracture of the skull in battle, 146 B. C., the surgeons immediately performed the operation of trepanning. Such references are the exception and apparently the general practice was to leave the wounded to die or to recover as best they could with no prearranged plan to care for them.

"At no time during the Middle Ages, or even during the Renaissance did physicians undertake any surgical work." "Even as late as the 11th century the armies had no surgeons."

The St. John Ambulance Association of England may be called the oldest first aid association in the world, originating in 1048 during the Crusades. However, as far as actual work was concerned it really lay dormant for several centuries to be revived in its present form in 1877. It now has thousands of branches in England and scores in Canada. For the most part, even in Ambroise Paré's time, "wounded common soldiers were left to the ministrations of their companions in arms or to the camp followers." Many were killed if they were suffering too much. The nobility in the 16th century brought their own surgeons to war. Paré was originally a barber surgeon and as chief surgeon to King Henry II, saw his first army service at the Battle of Turin in 1537.

The first official sanitary service, foundation of the present army medical service, was created only about three centuries ago. For the first time first aid in war began to be handled through medical organizations to any extent. The layman gladly shifted this responsibility, for which he was not trained, to the military man. But military hospital and relief work left much to be desired and laymen continued to assist. In 1813, during the Napoleonic wars the ladies of Frankfort united to found the Frauenvereine of that city. Its express object was to insure "more complete arrangements for the care of the sick and wounded, and to assist in providing for the wants of the military hospitals of Frankfort without distinction of friend or foe." This organization existed for at least seventy years and may still be active.

The public press was largely responsible for bringing before the English people the entire inadequacy of her medical field service in the Crimean War of 1854. As a result Florence Nightingale and her forty women helpers became a civil volunteer corps in the Crimea. They showed the world what military hospitals ought to be.

Within a month of the start of our Civil War our own medical and hospital field service was found distressingly inadequate. Laymen organized the Sanitary Commission which required many months before it could obtain official recognition. Gradually it grew, supported by committees all through the North, until "its huge four-horse wagons were galloped and halted on the very edge of battle, men sprang from them and, through the thickest of the fight, bore their rescued, wounded men to a place of safety and care provided for them." Clara Barton says: "It is probable that no other act of our country ever won for it the amount of moral credit and respect from other nations which has resulted from this unparalleled display of active humanity." The Sanitary Commission ceased to exist shortly after the Civil War. In all the wars of that time unofficial relief was found necessary but the efforts were sporadic and short lived.

In 1859 a Swiss gentleman, Monsieur Dunant, while traveling in Italy, happened to be in the neighborhood of Solferino on the day of the great battle, the 24th of June. He was impressed by the sufferings on the battle field and in the hospitals where he remained to assist as a volunteer. In 1862 he published a description of what he had seen under the title "Un Souvenir de Solferino" and proposed the founding in every country of permanent societies for the relief of the wounded. This led to an international conference held at Geneva in October 1863 and attended by delegates from sixteen European governments. Plans were made for establishing central relief committees in each country. A second congress was held in August 1864, the delegates having been accredited by their governments with sufficient power to sign a treaty. One was prepared providing for the neutrality and security of hos-

pitals and persons employed in them even after the enemy had occupied the ground, that field hospitals should not be subject to capture, military protection for civilians who cared for wounded in their homes, requisite care and treatment for wounded prisoners, a flag for hospitals and convoys and an arm badge for persons. The design was a red cross upon a white ground. This was a compliment to the country in which the congress was sitting, this being the national flag of Switzerland with the colors reversed—her flag being a white cross on a red ground. This general treaty was signed by twelve governments at first,—a remarkable tribute to the efforts of one individual in private life. His accomplishment was later recognized when in 1901 one-half of the first Nobel Peace Prize was awarded to Monsieur Jean Henri Dunant. The organization was known as the International Committee for Aid to the Military Wounded. It was not long before its tremendous value was proved in the Franco-Prussian War of 1870.

The United States was officially represented at both the Conference of 1863 and the Congress of 1864 but our government declined to sign the treaty on the ground that we were in the midst of war. Sporadic efforts were made to obtain its adoption up to 1877 when Miss Clara Barton headed a committee for this purpose. She had been through the Civil War with the Sanitary Commission, and through the Franco-Prussian War working with the Red Cross committees. In the latter she saw the Red Cross accomplish in four months what we had failed to accomplish in four years of civil war without it. She determined to try to make the American people understand the Red Cross and the treaty. She made an official presentation to President Hayes in 1877 and worked doggedly until the treaty was finally proclaimed by President Arthur on July 26, 1882. We were the 32nd nation to sign the treaty, the last civilized nation of that time. But we were the first to add to the scope of the organization, in addition to the relief of sufferings by war, those by "pestilence, famine, fire, flood, and other calamities, so great as to be regarded as national

in extent." Miss Barton was elected the first president of the American Association of the Red Cross.

Methods of organized first aid were developed largely in war experience, but its use in civil life has continued to be stressed more largely, until this now occupies possibly the major place. The first society devoted expressly to aiding in the recovering of drowning persons was established at Amsterdam in 1767. The Italian States followed in 1768 and the city of Paris in 1772. At London in 1774 was founded the Royal Humane Society. Its purpose was to "restore animation suspended by the effects of water, cold, convulsions, noxious vapors and lightning" and to prevent accidents at sea. The Life Saving Service of the City of New York is a volunteer organization established fifty years ago and still active.

Various organizations were started with first aid purposes, but most of them appear to have declined rapidly after the passing of their founders. In New York the Society for Instruction in First Aid to the Injured was founded in 1884. "Our object is clearly defined; we would aid those who have sustained bodily injury; would make them comfortable, and save life and limb, if possible, during that trying period when the physician is being sought for, perhaps in vain." From its list of officers it was apparently a lay organization with a Medical Director. Several editions of a first aid handbook were prepared. In the past twenty years its work has been taken over largely by the Red Cross.

The National Volunteer Emergency Service was incorporated in New York in 1900 by four doctors and twenty-three laymen, twelve of whom were ministers. It had a complete military set up from major-generals down with uniforms and purchased commissions. Its aims were theoretically good but from the last publication, which I found, dated 1908, it seemed to have accomplished little and apparently disappeared.

On February 9, 1903 a department known as "First Aid to the Injured" was established in the American National Red Cross. A section was added to the By-Laws, Dec. 8,

1903 which provided for its permanent operation,—the formation of classes of instruction in first aid, methods of treatment of the injured and other necessary provisions. Mr. Edward Howe, a member of the St. John Ambulance Association of England, was made superintendent of the new department.

The American Red Cross passed through a drastic reorganization during 1904. Clara Barton resigned as president after twenty-two years' service and the First Aid Department was discontinued. However it was reestablished in 1908.

The New England First Aid Association was organized in Boston, November 17, 1904. Classes of instruction were formed in police and fire departments, railroads, clubs and societies, including the Y.M.C.A. Six months' work showed that it was spreading rapidly over the whole country and the National First Aid Association of America was incorporated April 18, 1905. The founders seem to have been chiefly laymen. Miss Barton was elected president. Various local and state first aid societies associated themselves with it. The first city to accept this work in its schools and operate a first aid class among its teachers was the city of Everett, Mass. in 1907. The first corporation to see the great possibilities in giving their employees first aid instruction was the Simonds Manufacturing Co., at Fitchburg, Mass. From its annual reports this organization seems to have accomplished much in its first few years. However following the death of Miss Barton in 1912, when over ninety years of age, we find little record of it, although a magazine was published at least up until 1924.

Meanwhile after the First Aid Department had been discontinued by the American Red Cross in 1904, Mr. Edward Howe, who had been brought from England to supervise it, went to Chicago. Here he organized the American White Cross First Aid Society. Its objects were: "A national system of education in principles and methods of first aid emergency treatment of those injured by accident and organization of ambulance brigades and nursing corps for volunteer service." It does not seem

to have survived long but is interesting because on its board of directors were Frank Billings, J. B. Herrick, Nicholas Senn and John B. Murphy. Its Surgeon-in-Chief was Nicholas Senn.

The Pennsylvania Railroad commenced first aid on its lines in 1904. It installed a package of sterile dressings and stretchers in baggage cars, stations, shops, etc. Wooden splints were also added in some places.

The American Red Cross returned to this work in 1908 and in a few years became the recognized leader in the field of organizing and training in first aid. President William H. Taft said in 1909 that the Red Cross should "proceed with the organization of instruction in precaution against accident and first aid among the miners, railroad men, industrial employees, firemen, policemen, sailors, school teachers and the people generally." Major Charles Lynch, Medical Corps, U. S. Army, was detailed in 1909 by the Secretary of War to have charge of first aid for the Red Cross. In the previous year he had prepared a text-book on first aid for them. This went through a number of editions, including industrial, miners', police and firemen's, railroad, and women's. It was translated into many languages including Italian, Slovak, Polish, Lithuanian, Spanish, Portuguese and Chinese. In 1910 the Pullman Palace Car Company presented to the Red Cross a completely equipped first aid railway car from which instruction could be carried on along all main line railroads. This was devoted primarily to teaching first aid to railroad employees, but other people were also given instruction at the various stops. By the end of 1911 two cars were in operation and by 1918 over 1,000,000 persons had received instruction through these cars.

First aid training had progressed far enough so that at the Ninth International Conference of the Red Cross in 1911 an outdoor exhibition was given by the Army, Navy, Boy Scouts, railway trainmen, firemen and policemen. In 1912 a course of instruction was begun for the employees of the Bell Telephone Company of Pennsylvania. From this followed the nation wide training of telephone per-

sonnel which exists at present. Also in 1912 a first aid motion picture film was produced by the Edison Company. In 1914 water first aid (life-saving service) was inaugurated.

In 1915 courses of instruction in first aid were commenced among employees of the logging camps and saw mills in the State of Washington. In 1916 a start was made in adding the limestone, sandstone, slate, marble and granite quarries of the United States to this work. In 1920 intensified instruction was commenced in schools and colleges, and among policemen and firemen, soldiers and sailors, and state departments of labor and industry. Between 1910 and 1922, 164,121 persons completed a first aid course and received a Red Cross Certificate. In 1923 forest rangers and employees on reclamation projects were added to the groups instructed. In the fiscal year ending June 30, 1936, 222,693 First Aid Certificates were issued. The courses were taught by 9,662 instructors, 6,490 of whom were lay instructors and 3,172 were professional or doctors of medicine. Over 1,170,000 certificates have been issued since 1910.

In 1935 two campaigns were started,—one against Home and Farm Accidents and the other for Highway Emergency First Aid Stations. The ideal of the latter is to help in the problem of motor accidents along rural highways. The individual stations are under supervision of the local Red Cross Chapters. After sixteen months' effort on October 1, 1936 there were 1149 stations in operation in 47 states; 3466 more stations had been definitely promised by the chapters. The chief delay in these is obtaining trained personnel. The Red Cross has requested the assistance of the medical profession in training this personnel. In many places this cooperation has been obtained with difficulty, if at all. Fixed traction splints are part of the equipment and inasmuch as the Red Cross commenced to train its instructors in this only three years ago, the help of the medical profession is needed badly. The major difficulty is that so many of the medical profession know nothing about it.

In 1936 a plan for Mobile Emergency First Aid Units was issued and it is expected that some of these will be in operation soon. A unit will consist of one or more men attached to a work truck, automobile or motor-cycle in connection with their regular employment and who have been trained in Red Cross First Aid. They must have the permission of their organization to give emergency first aid care to the victims of highway accidents as they may come upon them in the course of their regular duties. This will concern particularly state police and state highway departments and public utility companies. They have no direct connection with the fixed Highway Emergency First Aid stations but will supplement their work in first aid without transportation.

Instruction in first aid is given by the United States Army, Navy and Coast Guard Service to its personnel. As a result of the proved efficiency and value of the Red Cross training it is also given by the following organizations, among others:

U. S. Public Health Service
U. S. Bureau of Mines
American Red Cross
National Safety Council
Boy Scouts
Girl Scouts
American Public Health Association
American Railway Association
American Gas Association
American Petroleum Institute
Edison Electric Institute
Many individual industries
State and local police departments
Fire departments

The National Safety Council was organized in 1913. Its efforts have been directed particularly toward accident prevention, where it has rendered outstanding service. It has also contributed considerably to first aid work by showing the gravity of the problem through its gathering and publishing of accident statistics, in most striking form;

by the publication and distribution to its members of about one hundred different pamphlets; by encouraging first aid training, as given by the American Red Cross and the United States Bureau of Mines, throughout all industry; and offering medals as awards in local, state and national first aid contests. It also awards a President's Medal to anyone who successfully applies the Schäfer Prone Pressure method of resuscitation in any emergency.

In this country education of the miners in first aid was first taken up systematically in the Pennsylvania anthracite mining district at Jermyn, Pa. in 1899, later spreading to Alabama and Indiana. When the Bureau of Mines of the Department of the Interior began its nation-wide campaign of instructing miners in the use of mine rescue apparatus and in methods of first aid (about 1913) the American Red Cross turned over that part of its industrial training work to the Bureau of Mines. This had been carried to a high point of efficiency by Dr. M. J. Shields since 1909. This arrangement has been continued since, the Red Cross cooperating in the preparation of first aid manuals in 1916 and 1921. Up to September 1, 1929, approximately 395,000 men had been instructed in these methods. The latest revision of the Manual of First Aid Instruction was made in 1930 entirely by first aid instructors and surgeons connected with the Bureau of Mines, with the idea of standardizing the methods for all industries it serves. The Bureau of Mines maintains eleven mine safety stations in stationary buildings and eleven in movable rescue cars. These are located in nineteen states and each has a first aid instructor to give training and demonstration.

The Boy Scouts of America, with a present membership of over one million, have an important place in first aid. Instruction in this for Scouts and Scout leaders was commenced in 1910. Cooperation with the Red Cross has been maintained since that time. Knowledge of elementary first aid is one of the requirements to become a Second Class Scout. The extent of this training must be considerably widened before one may become a First Class Scout.

One cannot attain to the rank of Life Scout or Eagle Scout unless one has qualified for a certain number of merit badges. In each case one of these must be a merit badge in first aid. Between 1911 and August 1936 over 275,000 merit badges in first aid were awarded. There is also an advanced course in first aid which has been taken by 1488 scout leaders during the past five years. It is stated authoritatively that the number of instances in which first aid training is put to practical use by Boy Scouts runs very high. Every troop is urged to have on hand a set of fixed traction splints for instruction and emergency purposes.

Recently the American Relief Administration Children's Fund, Inc., has made available to the Boy Scouts a sum of money to be used over a five year period for the aggressive promotion of the Boy Scout health and safety program. First aid instruction has a prominent place in their five year objective.

The Girl Scouts, with a membership of over 300,000 also give good first aid instruction. The Red Cross has supervised their work since 1913.

I wish to call your attention to a few recognized first aid methods, as examples, about which some practitioners might know more with advantage. The Prone Pressure Method of artificial respiration was brought out by Sir Edward Sharpey Schäfer in 1903. A standard technique of applying it was approved in 1927 by the American Gas Association, American Red Cross, American Telephone and Telegraph Company, Bethlehem Steel Corporation, National Electric Light Association, National Safety Council, Bureau of Medicine and Surgery, Navy Department; office of the Surgeon General, War Department; U. S. Bureau of Mines; U. S. Bureau of Standards; and U. S. Public Health Service. It is recognized as the most efficient and safest method. Yet one still usually finds it side by side with the Sylvester method in many medical text-books. I would wager that more medical men in this audience have made use of the Sylvester than the Schäfer method. Recently there has been added the Holgar-

Nielson method from Denmark. Is there any reason why a layman should not ask your opinion of it? I was asked mine and had to admit that I had never heard of it. I looked it up and found that I had to depend on laymen to inform me about it. It should not be recommended.

You are fortunate if you have a text-book of surgery which tells you the modern treatment of snake bite. Yet if you have ever practiced in the country you have seen patients who have been, or more probably think they have been, bitten by a snake. A tourniquet to increase bleeding, a deep cross cut over the fang marks, but then, instead of the application of a caustic, as formerly, suction is continued for at least one-half hour with the mouth or a breast pump.

The treatment of sunstroke and heat exhaustion are entirely different. For us to treat both with cold water or ice may kill one of them. First aid men are well aware of this, but I did not get it out of medical school.

These are merely examples of methods of care which are better known frequently by the first aider than the doctor. The duty of the first-aider ends where the physician begins. It would be unfortunate if we arrived while these treatments were still under way and we were not sufficiently acquainted with them to continue. In 1934 drowning caused 7,326 deaths, poisonous gas 1,695, electric shock 723, snake bite 147, and excessive heat 3,250. There are plenty of lives to be saved by both the physician and the first-aider.

The tannic acid method of treating burns was introduced about 1925 by Davidson. Anyone who has had opportunity to use it gladly agrees that it has many advantages over any treatment previously used. A good result is jeopardized if any kind of grease or ointment is applied first. The American Red Cross in the 1933 edition of its Text-Book was already recommending tannic acid in first aid and explaining the folly of greases. It will take a long time for the many texts which follow the Red Cross to be changed and still longer for the idea to reach the public generally. Sometimes I think that the period is even longer

before a new, but admittedly correct, idea is adopted by the majority of the medical profession. The first-aider is anxious for our advice as to new and improved methods if we can make them practical. The layman wishes to bring the injured to the physician in better condition for the doctor's treatment. It is unfortunate that so few physicians have maintained an interest in first aid methods that hardly any of our profession are really of value even in a consulting capacity.

Hemorrhage and fractures are the most important two conditions which confront the first-aider. Of these, fractures are many times more frequent, probably occurring about a million and a half times a year in this country.

In major fractures the initial care given at the place of accident and the method of transportation influence the ultimate good or poor result. Death, permanent disability, loss of earning power and dependence on the community may be the price of lack of knowledge of, or attention to, the necessary details of what should be done at this critical time.

At the instant a bone is broken, nature tries to protect the part from more injury. If there is any displacement of the fragments the muscles shorten causing the fragments to ride by one another resulting in the only possible natural splinting. Such splinting is fairly effective while the part is at rest, but does not offer sufficient protection while moving the part or the patient. At the time of the original injury, or as a result of overriding of the fragments, the surrounding soft parts are damaged as well as the bone. The soft parts concerned are periosteum, muscle, blood vessels, nerves, connective tissue and fat. In transporting without effective splinting the fragments are liable to be moved about causing more, often irreparable, damage to the soft parts. Not only may large blood vessels or nerves be torn but such motion causes pain, with its resultant increase in shock. Moreover in compound fractures motion of the fragments adds the risk of spreading infection through tissues not exposed to infection at the time of the original trauma.

A bone may be broken in an accident and no displacement of the fragments occur. Suppose a person is allowed to bear weight on such an injured leg or to be moved without the proper splinting, displacement of bone fragments may occur and any of the unfortunate results mentioned above may follow. Not infrequently a closed fracture will become compound, making the result as to life, limb and permanent disability much more serious than if the fracture had remained closed.

All of these occurrences can be prevented if sufficient pull is applied to the part to overcome the muscular contraction and thus to preserve the original length of the bone. This is easy if applied immediately after injury before the muscles have had an opportunity to become fixed in spasm. Early reduction is facilitated and the length of disability in such cases is decreased. Late reductions are lamentable and difficult and are often followed by long disability.

The advantages of proper transportation are:

1. For the patient it decreases the danger of further injury, increases comfort and lessens shock.
2. For the surgeon it simplifies reduction.
3. For the hospital as well as the patient it shortens his stay by promoting earlier union and lessening the danger of non-union.
4. From the economic side, the expense to industry is diminished because the injured man spends fewer days in the hospital and returns to work more quickly.

The majority of the ambulances going to the place of accident are manned by laymen. Since most of the initial care will be rendered by lay persons the physician must be acquainted with the best methods in order to guide the general policy and instruct individuals. Since the injured will usually be seen first by the physician at office or hospital, the physician should arrange in his community that approved methods of care and transportation are employed in order to obtain the best result in the least time. This initial care will continue to be rendered by the lay public. It does not constitute treatment, but if properly given

will make the professional treatment simple and more effective. There can be no clash of interest between the physician and the lay public in this matter.

Principles of Initial Care:

1. If suspicious that a fracture is present, render care as a fracture.
2. Combat any shock.
3. Avoid all unnecessary handling.
4. Protect any existing wound by the best means available.
5. Splint effectively, wherever found, before transporting.
6. Transport carefully.

The injured person should first be examined rapidly and gently to determine whether he is seriously hurt. The clothing does not need to be removed. In examining an injured person keep him thoroughly covered except the part actually being examined. One should depend on local pain, loss of function, deformity and malposition of the limb for the emergency diagnosis of fracture and should not try to obtain crepitus or false point of motion. If the patient thinks that he felt a bone "snap," for emergency purposes, we should be satisfied with his history and not attempt to prove the diagnosis on the street.

The saving of life comes first, the saving of limb second. If the patient is in severe shock this demands treatment before anything is done for the injured limb. There is no use in splinting a limb carefully while neglecting to treat shock from which the patient may be dying. On the other hand traction on an extremity may be an effective means of combating shock. If a physician is present morphine is the best treatment for shock. Sufficient morphine should be given to relieve pain and thereby quiet the patient's restlessness. The body heat must be maintained by sufficient extra covering and the use of external heat.

If a wound is suspected, the seams of the clothing are split to expose the region. If a wound is found, which may possibly connect with a fracture, it should not be washed out. Fresh mild tincture of iodine, if available, may be

applied to the surrounding skin and projecting bone. This should not be applied to exposed soft parts, unless of small extent, since it causes pain. A sterile compress should then be placed over the wound. Bleeding should be stopped. It is rare that this cannot be done with a firm compression bandage.

Tourniquets should not be used until compression of the wound has proved of no avail. Deaths have been caused by an improperly applied tourniquet which allows some arterial blood to enter the part and only shuts off the venous return. It is common to see all bleeding stop as soon as a tourniquet is removed.

If a tourniquet must be used it should be loosened every half hour to allow blood to return to the part distal to the tourniquet. If a tourniquet is applied too tightly or for too long a period gangrene, paralysis from nerve pressure, or lowered resistance to infection may result.

Do not attempt to replace the fragments in a compound fracture with projecting bone. If the bone disappears beneath the skin in the course of the application of traction, this should not cause anxiety. The patient must be operated on in any case to clean the wound. It is important to have word accompany the patient that the bone has been exposed in order to guide the physician treating the patient. Traction is more necessary in compound than in closed fractures, to lessen the danger of spreading contamination in the soft parts and to diminish the greater shock.

The patient should not be picked up hastily and dumped into the first automobile and rushed to a doctor's office or hospital. It is far better to cover him adequately and let him lie on the ground where he was found, until splints can be put on, and then move him in an ambulance. If it is necessary to change his position at all before splinting, in the instance of an extremity fracture, a continuous pull should be exerted by hand on the injured part while he is being moved.

The only effective and advisable method for transporting patients with fractures of the long bones of either upper

or lower extremities is in some form of fixed traction. This requires the use of a splint of the Thomas type. Fixed traction is that in which the pull is exerted from fixed points above and below the fracture so that the pull remains the same whatever the position of limb or splint. Overriding is characteristic of these fractures and there can be no generally effective immobilization without traction. In addition traction relieves pain and shock and prevents further damage in transportation. The fixed traction splint should be applied if there is any possibility of fracture between the hip joint and the foot or between the shoulder joint and the middle of the forearm, no matter whether the injuries are closed or compound.

The full ring Thomas splint can be used on either upper or lower extremity. More generally applicable and advisable splints of the Thomas type are the Murray-Jones hinged arm splint for the upper extremity and the Keller-Blake hinged half-ring splint for the lower extremity. These splints should be applied wherever the patient is found before moving him.

There are certain standards that are necessary in the application of this general method. It does not make any difference what particular procedure is used so long as one appreciates what it is sought to accomplish.

In the use of traction there are six requirements:

1. There must be some adequate form of hitch, and it is necessary to protect the part beneath the hitch so that it will not be injured.

2. The application of a traction hitch above the ankle or the wrist.

3. There must be some means of increasing traction so that the desired pull is obtained.

4. The extremity being in traction, it must be supported from below. One must not depend merely on traction for the entire support of the limb.

5. Lateral movements must be prevented.

6. The whole splint must be suspended in such manner that the heel will never be pressed upon.

In hospital practice a traction splint should be applied immediately in the emergency room, if it has not been done before. The patient is transported to the X-ray room and ward with traction on. The removal of the patient's clothes is supervised so that if splint traction has temporarily to be loosened traction is maintained manually until splint traction can be reapplied. The traction splint is kept on during the trip to the operating room and until the patient is in the care of a surgeon.

If the mechanism of injury is such that a fracture of the spine might have been produced, transport as a fracture, even though no objective signs are made out in a cursory examination. Death or permanent disability result more commonly from improper transportation of fracture of the spine, sometimes unrecognized, than from any other injury. Pinching the skin and trying slight active motions of the extremities from below upward will determine rapidly whether or not there is marked cord injury.

In patients with possible fractures of the dorsal or lumbar regions the underlying principle of hyperextension should be observed in any moving and in transferring them from the site of accident. If found in any other position, the patient should be slowly and evenly rolled onto his face, with a sheet or blanket beneath him if one is available. If neither of these is handy and two other persons only are present the patient may be moved to the splint with one person lifting the shoulders and the other the thighs, the body being in the face down position. With sheet or blanket available the injured person is carried to the splint in the prone position in the improvised hammock with one person holding the sheet at either end. If three to six competently trained men are present the patient may be lifted with the entire body kept in a straight line without any twisting and placed face downward on the splint. Misdirected attempts to help may cause further damage.

The ideal position for transportation in possible fractures of the dorsal and lumbar regions is face downward on a rigid support. Ordinary stretchers do not answer the purpose, but only those in which the side bars are held

rigidly apart. In the absence of this, a wide board or a door may be used. The so called "ladder" splint is the simplest and most effective. It consists of two long boards fastened together by three cross pieces, either nailed or tied on. Each board is padded with a blanket or other material. The patient should be carefully tied in position so that jolts will not cause any movement. If paralysis is thought to be present all wrinkles in the clothing and hard objects in the pockets should be removed to prevent the patient lying on them with the probability of developing pressure sores later.

In possible fractures of the cervical vertebrae the head and trunk should be kept in the same position as found during movement to the rigid stretcher, etc. In addition to the usual body ties, rigid support, such as bags of sand should be placed either side of the head to prevent rotation.

Miss Clara Barton, first president of the American Association of the Red Cross, said in an address in 1907:

"When one shall know, not only how to give, but how to do, and possibly prevent; when every man may understand his wounded brother's need and how to meet it; when the mother shall know how to save her child in accident; when even the child shall be taught to lessen the pain or to save the life of its playmate—then comes the real help.

"Think, friends, what it would be,—yes what it will be, when all the rough, sturdy men of danger, living every hour in the face of accident and death, shall know what to do in the moment for his writhing companion in toil; when the homes—the children in the streets and in the schools —shall all possess the knowledge which this method of human beneficence teaches—this is First Aid—this is what it stands for—the lessons which it inculcates and its faithful apostles teach."

In considering "Trauma and Occupational Hazard" it is necessary that we remember the important part played by first aid. It behooves us to know at least as much about it as the hundreds of thousands of trained laymen. We should take pride in being able to advise them in their methods and cooperate in making new medical treatments

practically available to them. At the same time we must aim to keep the general medical profession abreast of the knowledge gained by experience in first aid work. The initial care of the injured is a tremendous public health problem in which the majority of the medical profession has displayed little interest and exerted almost no influence. Lay organizations are doing excellent work, but they are asking for more assistance from the profession than they have been receiving. Each of us has it within his power to remedy this.

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## REFERENCES

1. Accident Facts, 1936 Edition, National Safety Council, Chicago, Ill.
2. American Red Cross First Aid Text-Book, 1933 Edition, Wash., D. C.
3. Valpy, R. V., Anniversary Sermon, Royal Humane Society, London, April 4, 1802.
4. Haggard, H. W., Devils, Drugs, and Doctors, Harper Bros., N.Y., 1929.
5. Young, C. S. Clara Barton, Gorham Press, Boston, 1932.
6. Barton, Clara, Address before the American Social Science Association, Saratoga, Sept. 6, 1882.
7. History of the Red Cross, Government Printing Office, Wash., 1883.
8. Morton Bowditch, Handbook of First Aid to the Injured, 1st rev. edition, Morton Brown, N.Y. 1896.
9. The National Volunteer Emergency Service, Its Principles and Purposes, Adj. General's office, N.Y. 1908.
10. First Annual Report of the National First Aid Association of America, June 7, 1906; Second Annual Report, June 7, 1907.
11. First Aid, Official Journal of the American White Cross First Aid Society, vol. I, no. 1, April, 1905.
12. Hileman, J. B. Penn. M. J., 20, 412, 1917.
13. Red Cross Courier, various issues.
14. Annual Reports, American Red Cross, 1908 to date.
15. Manual of First-Aid Instruction, U. S. Dep't. of Interior, Bureau of Mines, 1930 revision, Gov't. Printing Office, Washington.